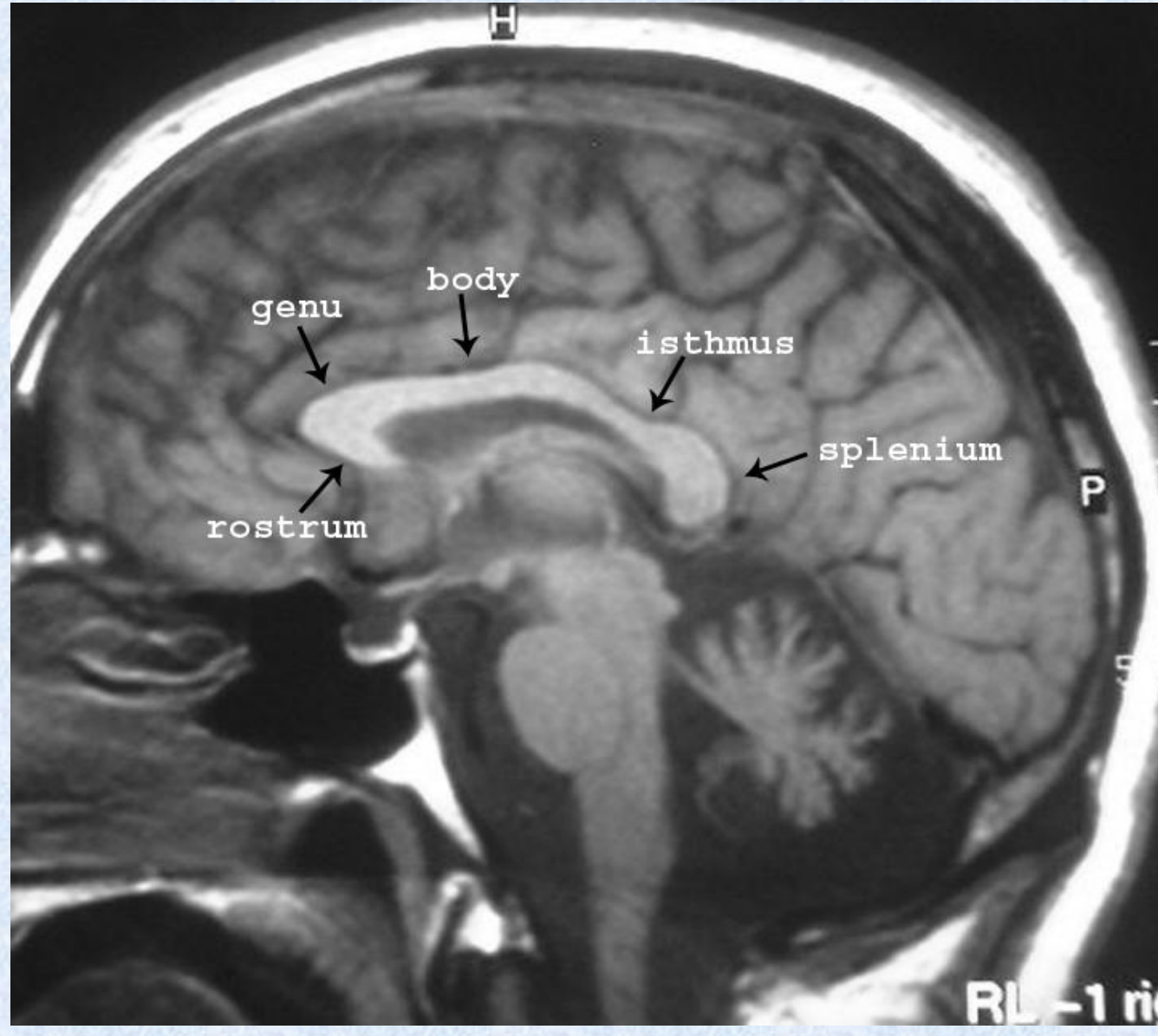


Image registration of corpus callosum

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Medicin og Teknologi

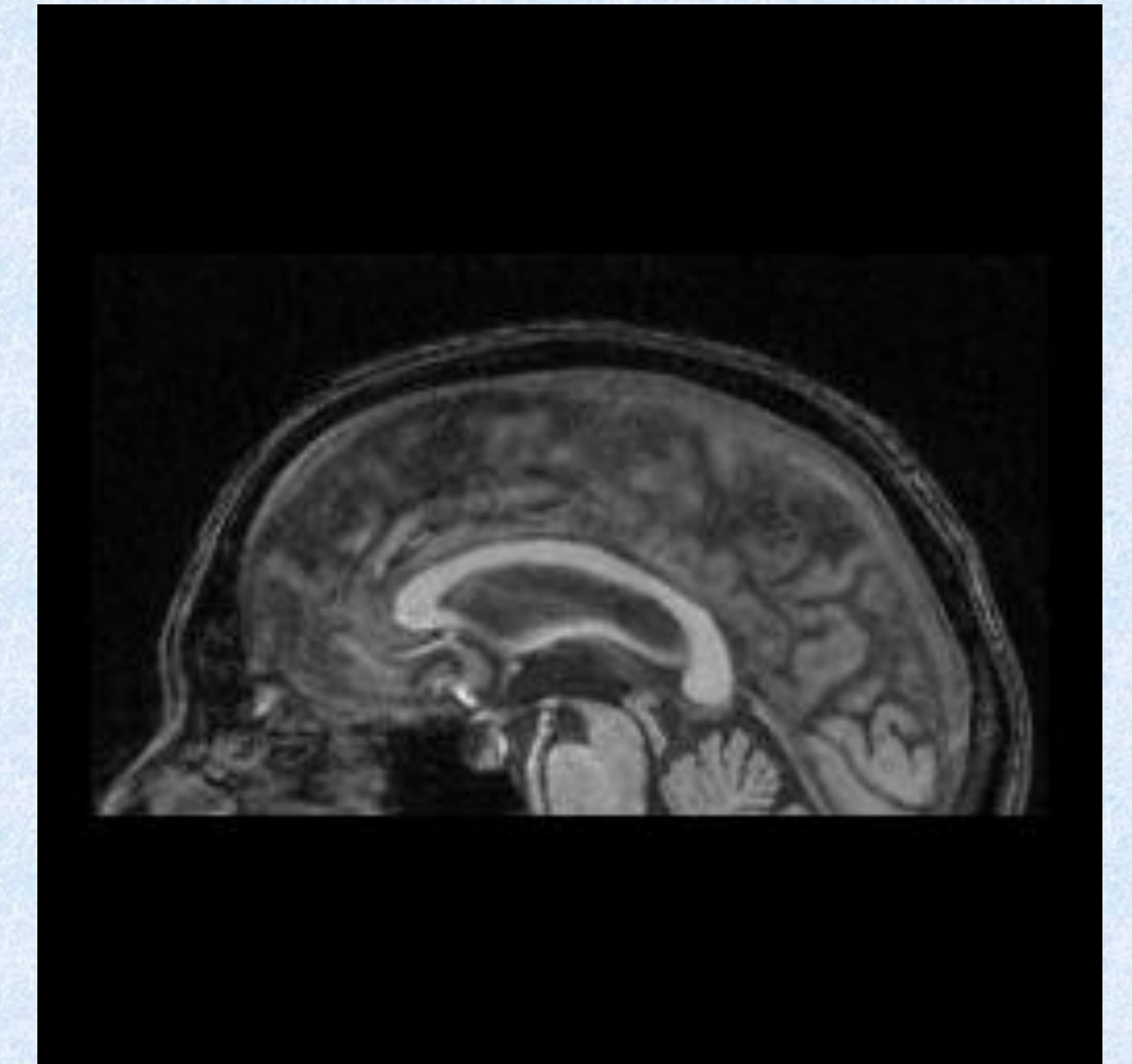
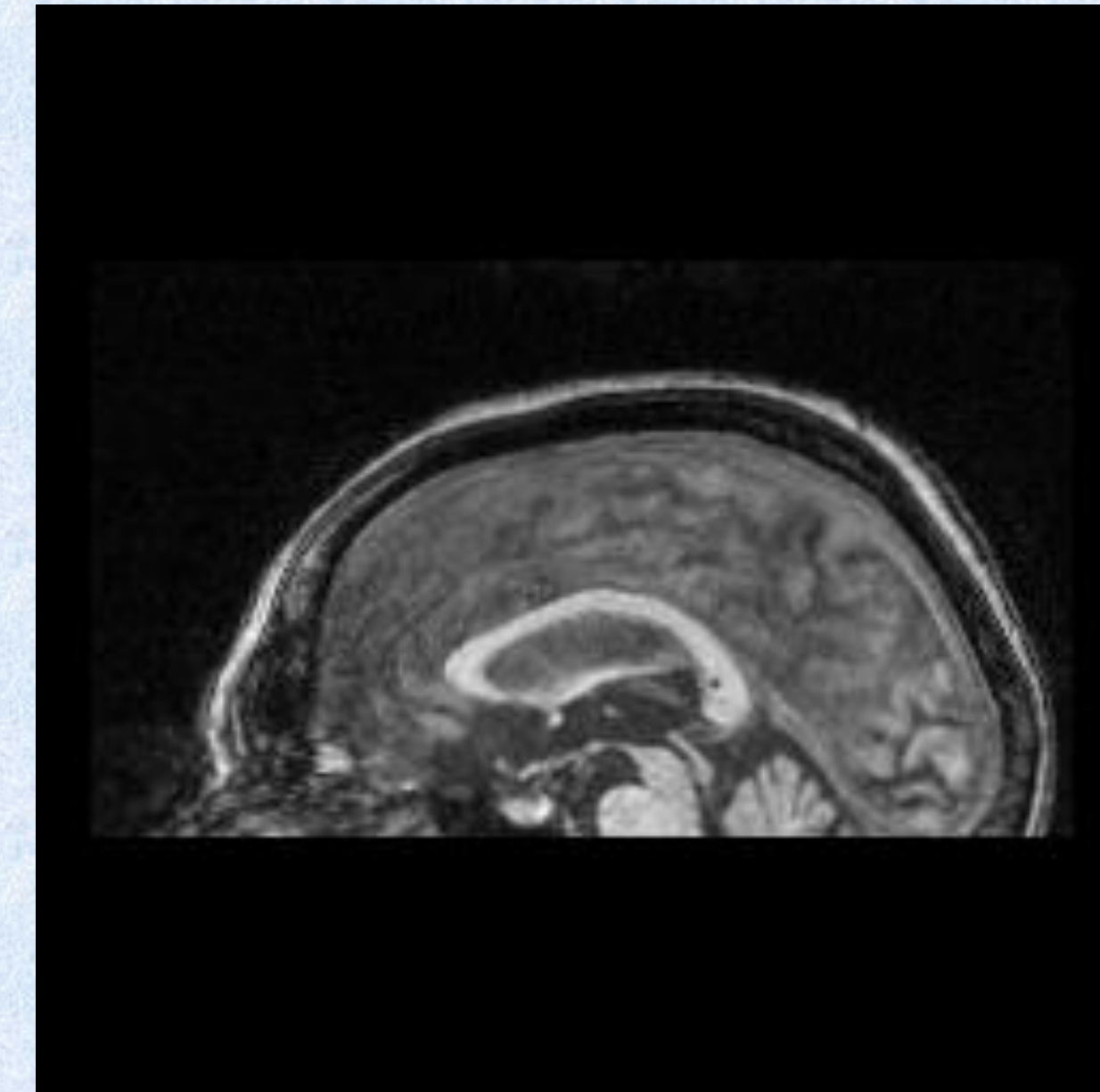


Hypothesis

In this exercise, we were given a dataset, containing three images of the corpus callosum., taken by a MR-scanner. The three images were CC1.bmp CC2.bmp and CC3.bmp. We will look at the shapes and sizes of the corpus callosum, and try to register CC2 and CC3 to CC1. We will take you through this process step by step and hopefully end up with a decent result.

We hope to, with a simple set of tools, be able to transform one image of the corpus callosum into another

This are the original images of the corpus callosum, CC1.bmp and CC2.bmp:

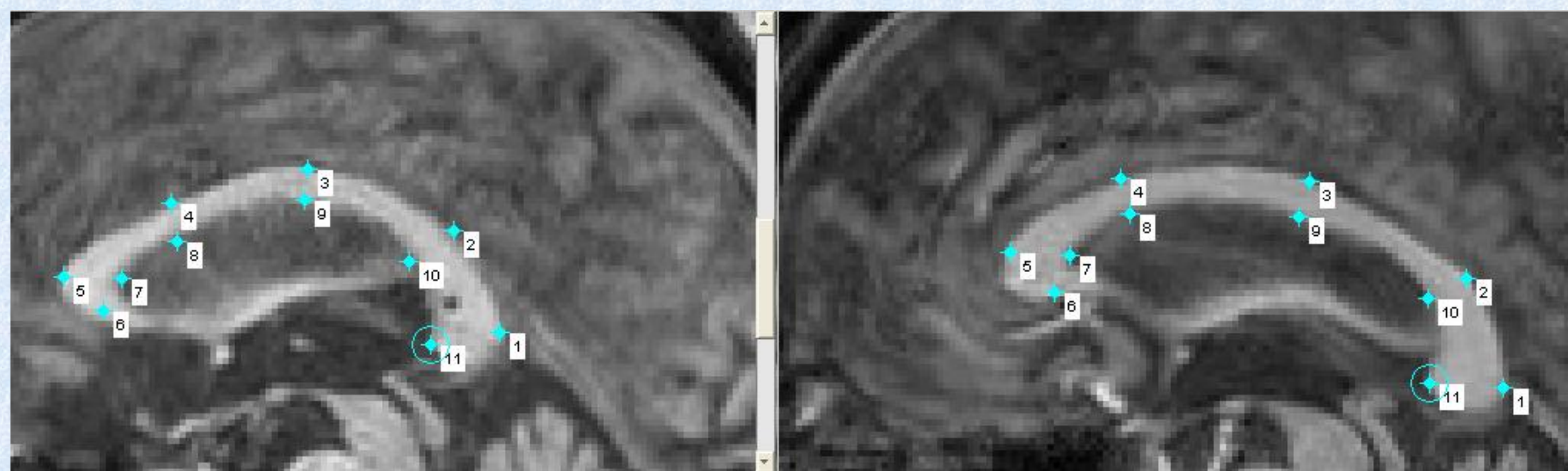


Anatomy

The Corpus Callosum is a flat bundle of neural fibers that connects the two cerebral hemispheres. It is located in the center of the brain and makes communication between the two hemispheres possible.

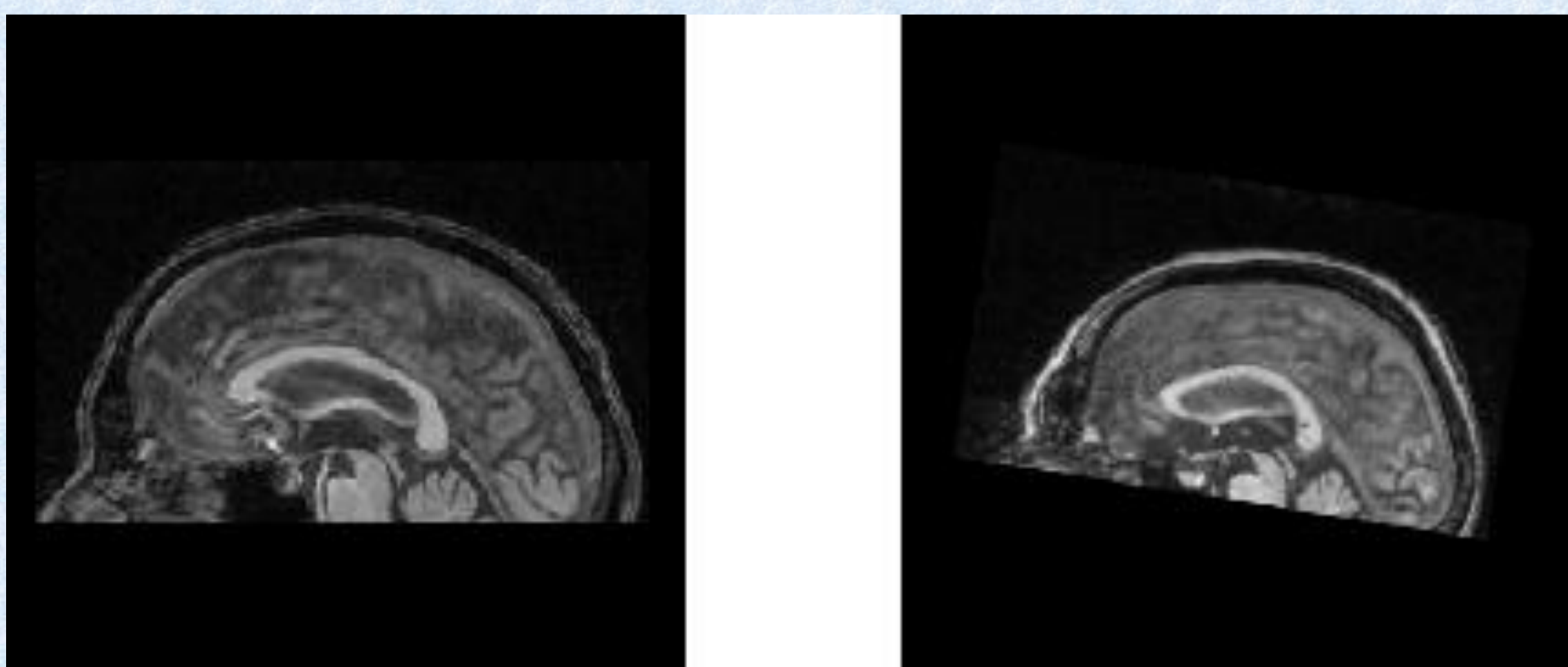
Landmarking

To compare two different corpus callosums, we used a tool called Landmarking. Landmarking is best used by an expert, where he/she marks anatomical correct landmarks in both the base and input image simultaneously like so:



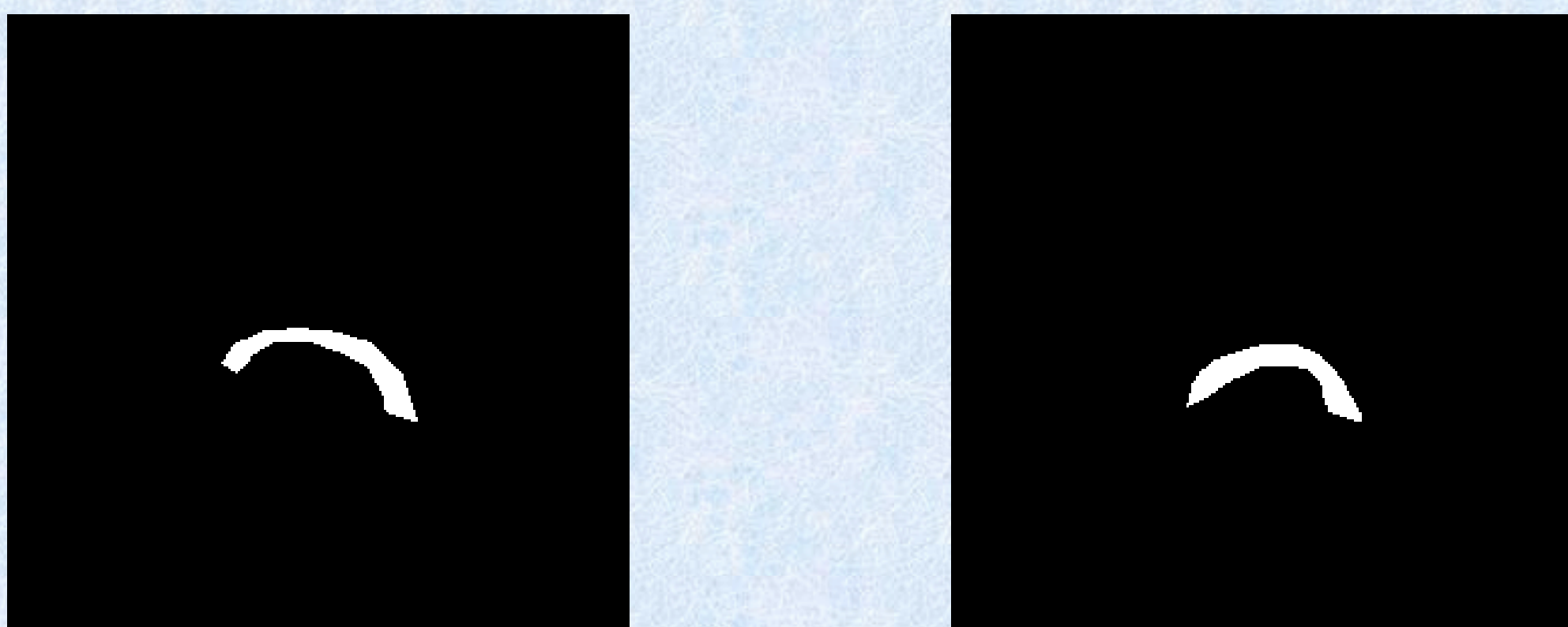
Transformation

We now use the former marked landmarks to transform the input image into the base image. The landmarks in the input image are then set to the same position as the corresponding landmarks in the base image. In this way, the input corpus callosum is transformed and aligned so it is possible to compare the two.



Roipoly

This is a MATLAB function we used to draw around the edge of the corpus callosum manually, making it possible to discard all irrelevant information. Here you can see the result of our own encirclement of the corpus callosum:



As you can see the MATLAB function returns a binary image of the desired area where the corpus callosum is giving the value 1 and the background the value 0.

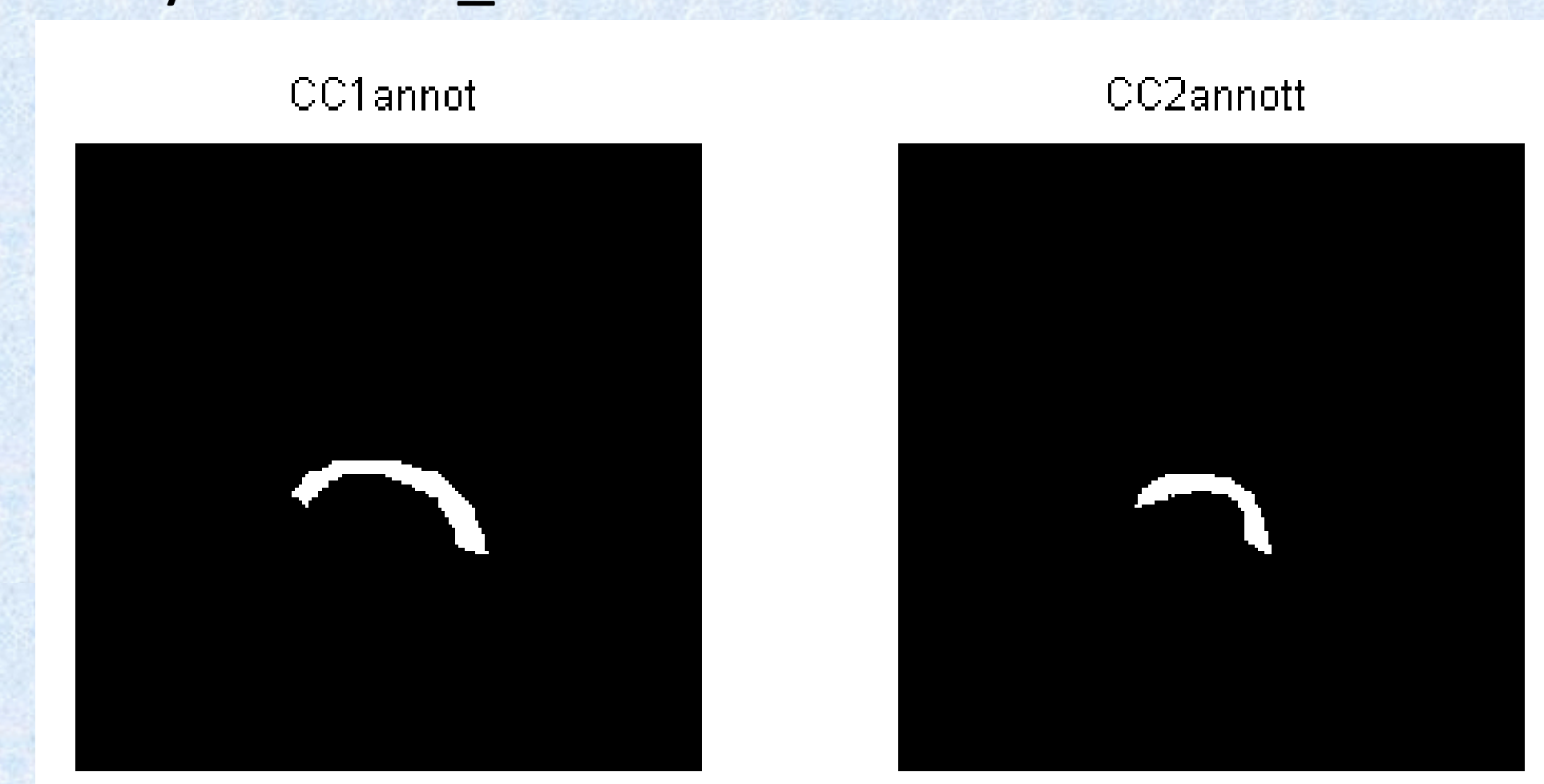
Conclusion

In the light of this process we can conclude, that we were able to transform and align one image into another. This can be seen on the image on the right, where the different colors appear. The yellow color represents the matching area between CC1 and CC2, the blue color is CC1 and the cyan color is CC2. The image next to the fitted image, show the fit before transformation. We have succeeded, more or less, in transforming the image CC2.bmp to fit the dimensions and shapes of the image CC1.bmp. The larger the yellow area we get, the better fit we obtain.

Binary Transformation

The binary transformation of the image CC2, is done after using the MATLAB function roipoly, to outline the corpus callosum precisely. This gives to binary images of CC1 and CC2, then we use the function imtransform in MATLAB, to transform CC2_annot into CC1. This is being done by the similarity transform, and by that transforming CC2_annot to CC2_annott, thereby into CC1. Later we will show, the two images together and by doing so, we can see the similarities.

Here is CC1 binary and CC2_annott



Label2rgb

This MATLAB function is used to convert a binary image into a RGB image, a color image. We have tried to make different colors in our RGB image, to illustrate the differences between the corpus callosum from CC1 and the corpus callosum from CC2. We can see our pixel values are different and that we have the values 0, 1, 2 and 3. Here is 1 the pixel value for CC1, and 2 is the pixel value for CC2_annott, and 3 is the common area for CC1 and CC2_annott.

Here they are displayed together:

